

### REMARKS

Applicant requests favorable reconsideration and allowance of this application in view of the foregoing amendments and the following remarks.

Claims 1-24 are pending in this application, with Claims 1, 8, 12, 19, 23, and 24 being independent. Claims 8, 19, and 24 have been amended. No new matter has been added.

The specification has been amended to correct the informalities described in paragraph 2 of the Official Action dated July 8, 2002. Favorable consideration is requested.

Claims 1-24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,659,664 (Kaja) in view of U.S. Patent No. 5,913,193 (Huang). Applicant respectfully traverses this rejection for the reasons discussed below.

As recited in independent Claim 1, the present invention is directed to a speech synthesis apparatus having a database for managing phonemic piece data, comprising a generating means, a search means, a re-search means, and a registration means. The generating means is for generating a second phoneme in consideration of a phonemic context for a first phoneme as a search target. The search means is for searching the database for phonemic piece data corresponding to the second phoneme. The re-search means is for generating a third phoneme by changing the phonemic context on the basis of the search result obtained by the search means, and re-searching the database for phonemic piece data corresponding to the third phoneme. Lastly, the registration means is for registering the search result obtained by the search means or the re-search means in a table in correspondence with the second or third phoneme.

Independent Claims 12 and 23 are directed to a control method and a computer readable memory, respectively, and correspond generally to Claim 1.

As recited in independent Claim 8, the present invention is directed to a speech synthesis apparatus for performing speech synthesis by using phonemic piece data managed by a database, comprising a storage means for storing a table for managing position information indicating a position of phonemic piece data in the database in correspondence with a phoneme obtained in consideration of a phonemic context made to correspond to the phonemic piece data and a calculation means for acquiring phonemic context information of a phoneme as a synthesis target and fundamental frequencies corresponding thereto and calculating an average of acquired fundamental frequencies. The apparatus also comprises a search means for searching a phoneme group corresponding to the phonemic context information from the table; an acquisition means for acquiring, from the table, position information of phonemic piece data corresponding to a predetermined phoneme of the phoneme group searched by the search means, on the basis of the average of fundamental frequencies calculated by the calculation means; and a changing means for acquiring phonemic piece data indicated by the position information, acquired by the acquisition means from the database, and changing a prosody of the acquired phonemic piece data.

Independent Claims 19 and 24 are directed to a control method and a computer readable memory, respectively, and correspond generally to Claim 8.

The Kaja patent relates to a method for speech synthesis with control parameters for controlling a speech synthesis device. The control parameters are stored in a matrix or a sequence list for each polyphone. However, Applicant submits that the cited art fails to disclose or suggest at least the above-mentioned features of the independent claims.

In particular, the Kaja reference fails to disclose or suggest a registration means for registering the search result obtained by the search means or the re-search means in a table in correspondence with a second or third phoneme, as disclosed and claimed in independent Claims 1, 12, and 23 of the present invention. The Kaja patent does disclose a matrix for storing polyphones, but this matrix is distinct from the index table for storing triphones of the present invention.

Moreover, the Kaja reference fails to disclose or suggest a storage means for storing a table for managing position information indicating a position of phonemic piece data in the database in correspondence with a phoneme obtained in consideration of a phonemic context made to correspond to the phonemic piece data and acquisition means for acquiring, from the table, position information of the phonemic piece data corresponding to a predetermined phoneme of the phoneme group searched by the search means, on the basis of the average of fundamental frequencies calculated by the calculation means, as disclosed and claimed in independent Claims 8, 19, and 24 of the present invention.

The Huang patent fails to compensate for the deficiencies of Kaja. Indeed, Huang discloses a method of searching repeatedly a candidate of an acoustic unit as a synthesis target during the synthesis of speech. In contrast, the present invention manages a database for managing phonemic piece data and an index table having substitute phoneme data with respect to all the conceivable phonemic contexts in advance to eliminate the process of searching repeatedly for phonemic piece data as a synthesis target.

Accordingly, Applicant submits that each of the independent claims is patentable over the cited art, whether that art is considered individually or taken in combination.

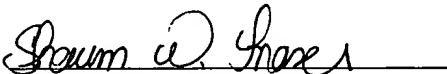
The dependent claims recite additional features that further distinguish the present invention from the cited art. Further individual consideration of the dependent claims is respectfully requested.

In view of the foregoing, Applicant submits that this application is in condition for allowance. Favorable consideration and withdrawal of the rejection set forth in the above-mentioned Official Action, and a Notice of Allowance are respectfully requested.

Applicant respectfully requests acknowledgment of the Claim to Priority filed on August 19, 1999. If such document was not received, Applicant requests notification so that Applicant's representative can forward copies of the Claim to Priority along with the stamped postcard receipt.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

  
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**MARKED-UP VERSION SHOWING CHANGES TO THE CLAIMS**

8. (Amended) A speech synthesis apparatus for performing speech synthesis by using phonemic piece data managed by a database, comprising:

storage means for storing a table for managing position information indicating a position of phonemic piece data in the database in correspondence with a phoneme obtained in consideration of a phonemic context made to correspond to the phonemic piece data;

calculation means for acquiring phonemic context information of [a] the phoneme as a synthesis target and fundamental frequencies corresponding thereto and calculating an average of the acquired fundamental frequencies;

search means for searching a phoneme group corresponding to the phonemic context information from the table;

acquisition means for acquiring, from the table, position information of the phonemic piece data corresponding to a predetermined phoneme of the phoneme group searched [out] by said search means, on the basis of the average of fundamental frequencies calculated by said calculation means; and

changing means for acquiring the phonemic piece data indicated by the position information, acquired by said acquisition means from the database, and changing a prosody of the acquired phonemic piece data.

19. (Amended) A control method for a speech synthesis apparatus for performing speech synthesis by using phonemic piece data managed by a database, comprising:

- a storage step of storing a table for managing position information indicating a position of phonemic piece data in the database in correspondence with a phoneme obtained in consideration of a phonemic context made to correspond to the phonemic piece data;
- a calculation step of acquiring phonemic context information of [a] the phoneme as a synthesis target and fundamental frequencies corresponding thereto and calculating an average of the acquired fundamental frequencies;
- a search step of searching a phoneme group corresponding to the phonemic context information from the table;
- an acquisition step of acquiring, from the table, position information of the phonemic piece data corresponding to a predetermined phoneme of the phoneme group searched [out] in the search step, on the basis of the average fundamental frequencies calculated in said calculation step; and
- a changing step of acquiring the phonemic piece data indicated by the position information acquired in said acquisition step from the database, and changing a prosody of the acquired phonemic piece data.

24. (Amended) A computer-readable memory storing program codes for controlling a speech synthesis apparatus for performing speech synthesis by using phonemic piece data managed by a database, comprising:

a program code for the storage step of storing a table for managing position information indicating a position of phonemic piece data in the database in correspondence with a phoneme obtained in consideration of a phonemic context made to correspond to the phonemic piece data;

a program code for the calculation step of acquiring phonemic context information of [a] the phoneme as a synthesis target and fundamental frequencies corresponding thereto and calculating an average of the acquired fundamental frequencies;

a program code for the search step of searching a phoneme group corresponding to the phonemic context information from the table;

a program code for the acquisition step of acquiring, from the table, position information of the phonemic piece data corresponding to a predetermined phoneme of the phoneme group searched [out] in the search step, on the basis of the average of fundamental frequencies calculated in the calculation step; and

a program code for the changing step of acquiring the phonemic piece data indicated by the position information acquired in the acquisition step from the database, and changing a prosody of the acquired phonemic piece data.

**MARKED-UP VERSION SHOWING CHANGES THE SPECIFICATION**

Please substitute the paragraph beginning at page 1, line 6 and ending at line 10, as follows.

--The present invention relates to a speech synthesis apparatus, which has a database for managing phonemic piece data and performs speech synthesis by using the phonemic piece data managed by the database, a control method for the apparatus, and a computer-readable memory.--

Please substitute the paragraph beginning at page 1, line 11 and ending at line 20, as follows.

--As a conventional speech synthesis method, a synthesis method based on a waveform concatenation scheme is available. In the waveform concatenation synthesis method, the prosody is changed by the pitch synchronous waveform overlap adding method of pasting waveform element pieces corresponding [one] to several pitches at desired pitch intervals. The waveform concatenation synthesis method can obtain more natural synthetic speech than a synthesis method based on a parametric scheme, but suffers the problem of a narrow allowable range with respect to changes in prosody.--



Please substitute the paragraph beginning at page 1, line 21 and ending at page 2, line 1, as follows.

--Under the circumstances, attempts are made to improve the speech quality by preparing various speech data and properly selecting and using them. As a criterion for selection of speech data, information such as [a] phonemic context (a phoneme to be synthesized or a few phonemes on two sides of the target phoneme) or [a] fundamental frequency F0 is used.--

Please substitute the paragraph beginning at page 2, line 22 and ending at page 3, line 13, as follows.

--In order to achieve the above object, a speech synthesis apparatus according to the present invention has the following arrangement. There is provided a speech synthesis apparatus having a database for managing phonemic piece data[, ] comprising[: ] a generating means, a search means, a research means, and a registration means. The generating means is for [generating means for] generating a second phoneme in consideration of a phonemic context for a first phoneme as a search target[;]. The search means is the [search means for] searching the database for a phonemic piece data corresponding to the second phoneme[;]. The re-search [re-search means is] for generating a third phoneme by changing the phonemic context on the basis of the search result obtained by the search means, and re-searching the database for phonemic piece data corresponding to the third phoneme[; and]. The registration means is for [registration means for] registering the search result obtained by the search means or the re-search means in a table in correspondence with the second or third phoneme.--

Please substitute the paragraph beginning at page 3, line 14 and ending at page 4, line 14, as follows.

--In order to achieve the above object, there is also provided a speech synthesis apparatus [according the present invention has the following arrangement. There is provided a speech synthesis apparatus for performing speech synthesis by using phonemic piece data managed by a database, comprising[;] a storage means for storing a table for managing position information indicating a position of phonemic piece data in the database in correspondence with a phoneme obtained in consideration of a phonemic context made to correspond to the phonemic piece data[;]. The speech synthesis apparatus also comprises a calculation means for acquiring each phonemic context information of a phoneme group as a synthesis target and fundamental frequencies corresponding thereto and calculating an average of acquired fundamental frequencies[;] and a search means for searching a phoneme group corresponding to the phonemic context information from the table[;]. Additionally, the apparatus comprises an acquisition means for acquiring, from the table, position information of phonemic piece data corresponding to a predetermined phoneme of the phoneme group searched out by the search means, on the basis of the average of fundamental frequencies calculated by the calculation means[;] and a changing means for acquiring phonemic piece data indicated by the position information acquired by the acquisition means from the database, and changing a prosody of the acquired phonemic piece data.--

Please substitute the paragraph beginning at page 4, line 15 and ending at line 20, as follows.

--In order to achieve the above object, there is also provided a control method for a speech synthesis apparatus [according to the present invention has the following steps. There is provided a control method for a speech synthesis apparatus] having a database for managing phonemic piece data, comprising[:] a generating step, a search step, a re-search step, and a registration step.--

Please substitute the paragraph beginning at page 4, line 21 and ending at page 5, line 7, as follows.

--The [the] generating step is for [of] generating a second phoneme in consideration of a phonemic context for a first phoneme as a search target[:]. The [the] search step [of] is for searching the database for a phonemic piece data corresponding to the second phoneme[:]. The [the] re-search step [of] is for generating a third phoneme by changing the phonemic context on the basis of the search result obtained in the search step, and re-searching the database for phonemic piece data corresponding to the third phoneme[: and]. Finally, the registration step [of] is for registering the search result obtained in the search step or the re-search step in a table in correspondence with these cond or third phoneme.--

Please substitute the paragraph beginning at page 5, line 8 and ending at page 6, line 8, as follows.

--In order to further achieve the above object, a control method for a speech synthesis apparatus according to the present invention has the following steps. There is provided a control method for a speech synthesis apparatus for performing speech synthesis by using phonemic piece data managed by a database, comprising[:] the storage step of storing a table for managing position information indicating a position of phonemic piece data in the database in correspondence with a phoneme obtained in consideration of a phonemic context made to correspond to the phonemic piece data[;] and the calculation step of acquiring each phonemic context information of a phoneme group as a synthesis target and fundamental frequencies corresponding thereto and calculating an average of acquired fundamental frequencies[;]. The control method also comprises the search step of searching a phoneme group corresponding to the phonemic context information from the table[;] and the acquisition step of acquiring, from the table, position information of phonemic piece data corresponding to a predetermined phoneme of the phoneme group searched out in the search step, on the basis of the average of fundamental frequencies calculated in the calculation step[; and]. Additionally, the method comprises the changing step of acquiring phonemic piece data indicated by the position information acquired in the acquisition step from the database, and changing a prosody of the acquired phonemic piece data.--

Please substitute the paragraph beginning at page 6, line 9 and ending at page 7, line 4, as follows.

--[In order to] To further achieve the above object, a computer-readable memory according to the present invention has the following program codes. There is provided a computer-readable memory storing program codes for controlling a speech synthesis apparatus having a database for managing phonemic piece data, comprising[:] a program code for the generating step of generating a second phoneme in consideration of a phonemic context for a first phoneme as a search target; a program code for the search step of searching the database for a phonemic piece data corresponding to the second phoneme; a program code for the re-search step of generating a third phoneme by changing the phonemic context on the basis of the search result obtained in the search step, and re-searching the database for phonemic piece data corresponding to the third phoneme; and a program code for registration step of registering the search result obtained in the search step or the re-search step in a table in correspondence with the second or third phoneme.--

Please substitute the paragraph beginning at page 7, line 5 and ending at page 8, line 8, as follows.

--Lastly, [In order] to further achieve the above object, a computer-readable memory according to the present invention has the following program codes. There is provided a computer-readable memory storing program codes for controlling a speech synthesis apparatus for performing speech synthesis by using phonemic piece data managed by a database, by comprising[:] a program code for the storage step of storing a table for managing position information indicating a position of phonemic piece data in the database in correspondence with

a phoneme obtained in consideration of a phonemic context made to correspond to the phonemic piece data[;] and a program code for the calculation step of acquiring each phonemic context information of a phoneme group as a synthesis target and fundamental frequencies corresponding thereto and calculating an average of acquired fundamental frequencies[;]. The computer-readable memory also comprises a program code for the search step of searching a phoneme group corresponding to the phonemic context information from the table; a program code for the acquisition step of acquiring from the table, position information of phonemic piece data corresponding to a predetermined phoneme of the phoneme group searched out in the search step, on the basis of the average of fundamental frequencies calculated in the calculation step; and

a program code for the changing step of acquiring phonemic piece data indicated by the position information acquired in the acquisition step from the database, and changing a prosody of the acquired phonemic piece data.--